

**REMARKS**

This Amendment is responsive to the non-Final Office Action of December 10, 2008. Reconsideration and allowance of claims 1-10, 12-19, 21-27, 30-40, 42-50, 52-58, 61-64, and 66-72 are requested.

**The Office Action**

Claims 1-4, 8-10, 12-37, 39-51, 64, and cancelled claim 65 stand rejected under 35 U.S.C. § 101.

Claims 1-10, 12-19, 21-27, 30-40, 42-50, 52-58, and 61-72 stand rejected under 35 U.S.C. § 112.

Claims 1-7, 9, 10, 12-19, 32-38, 40, 42-48, 66, 67, 69, and 70 stand rejected under 35 U.S.C. § 103 over Taylor (US 5,950,629).

Claims 8 and 39 stand rejected under 35 U.S.C. § 103 over Taylor in view of Sumanaweera (US 6,443,894).

Claims 21-27, 30, 31, 49, 50, 52-58, 61-64, 68, 71, and 72 stand rejected under 35 U.S.C. § 103 over Taylor in view of Wodicka (US 5,445,144).

**35 U.S.C. § 101**

The claims have been amended to address the 35 U.S.C. § 101 issues raised by the Examiner. As amended, it is submitted that all claims now comply fully with the requirements of 35 U.S.C. § 101.

**35 U.S.C. § 112**

The claims have been amended to address the 35 U.S.C. § 112 issues in a variety of ways. Some of the claims have been amended to define "haptic object" more completely within the claim itself, see for example claim 1. Other claims have been amended to replace the term "haptic object" with definitional materials, see for example claim 2. Other claims have eliminated the term "haptic object" as being unnecessary for patentability.

Second, the Examiner asserts that the word "object" generally connotes physical tangible entities, "except in the field of computer software and programming". The present application being in, related to, or analogous to computer

software and programming, the concept behind “haptic object” is, of course, not that of a physical object, but rather of a virtual object.

Further, the term “haptic object” is a well-defined, common term in the art to which this application pertains. The applicant refers the Examiner to the discussion in Amendment C, filed August 8, 2008, which is incorporated herein by reference.

Accordingly, it is submitted that all claims now comply fully with the requirements of 35 U.S.C. § 112.

**The Claims Distinguish Patentably  
Over the References of Record**

Claim 1 calls for a virtual haptic object that represents a virtual cutting boundary for the tool. Taylor neither discloses nor suggests a haptic virtual object, much less a virtual cutting boundary for the tool. Accordingly, it is submitted that claim 1 and claims 10, 12-14, and 16-19 dependent therefrom distinguish patentably and unobviously over the references of record.

Moreover, the dependent claims set forth numerous details which are neither shown by Taylor nor addressed by the Examiner. The applicant reserves the right to address these additional limitations on a claim by claim basis in future amendments or an appeal, as may be appropriate.

Claim 2 calls for defining a virtual cutting boundary for the surgical tool. Taylor fails to suggest such a concept. Claim 2 has eliminated the term “haptic object” to eliminate any ambiguity regarding the scope of claim 2.

Accordingly, it is submitted that claim 2 and claims 3-9 dependent therefrom distinguish patentably and unobviously over the references of record.

Claim 15 calls for a haptic object that represents a virtual cutting boundary and which is defined by a mapping between a pose of the tool and an output wrench of the haptic device. Claim 15 further calls for providing to the user tactile feedback which is indicative of the scalar distance between the tool and the virtual cutting boundary, which tactile feedback includes generating the output wrench via the haptic device. Similarly, claims 1 and 2 call for the haptic device to generate the output wrench. In contrast, Taylor does not disclose a device capable of generating output wrench (i.e., force and/or torque). Taylor simply discloses providing braking,

e.g., friction braking, rather than generating an output wrench, which would require, for example, the use of motors or actuators. Moreover, the braking force of Taylor as set forth in column 8, lines 4-34 relates to manual adjustment of the coarse motion manipulator 12. The discussed electric brake enables the operator to better control movement of the coarse motion manipulator while the fine motion manipulator 14 is being moved into the desired position. Once the fine motion manipulator 14 is moved into the desired position, the coarse motion manipulator 12 is locked. This manually controlled locking fails to describe or suggest mapping between a pose of the tool and an output wrench of the haptic object. Accordingly, it is submitted that claims 1, 2, and 15 distinguish patentably and unobviously over the references of record.

Claim 21 calls for a virtual guide surface and for determining a scalar distance between a current position of the tool and the virtual guide surface. Claim 21 also calls for providing force feedback via the haptic device that attracts the tool toward or repels the tool from the virtual guide surface. Taylor neither discloses nor suggests a virtual guide surface, much less determining a scalar distance between a current position of the tool and such virtual guide surface or providing attractive or repulsive force feedback.

Claim 32 calls for controlling an actuator of the haptic device to generate an output force or torque which varies with the scalar distance between the tool and the object of interest. Taylor only discloses simple braking and does not disclose generating a force or torque to indicate a scalar distance. Accordingly, it is submitted that claim 32 and claims 33-37, 39, 40, 42-50, and 64 dependent therefrom distinguish patentably and unobviously over the references of record.

Claim 38 calls for the object of interest to include at least one haptic object that represents a virtual cutting boundary for the tool. Moreover, claim 38 calls for the haptic object to be defined by a mapping between a pose of the surgical tool and the output wrench of the haptic device. Taylor fails to disclose or fairly suggest such a haptic object and makes no suggestion of mapping between a pose of the tool and a wrench of the haptic device. Accordingly, it is submitted that claim 38 distinguishes patentably and unobviously over Taylor.

Claim 52 calls for a virtual cutting boundary for the tool which is defined at least in part by a mapping between a pose of the tool and an output wrench of the haptic device. Claim 52 also calls for the haptic device to generate the output

wrench when the tool intrudes on the virtual cutting boundary. Again, Taylor fails to disclose such a virtual cutting boundary, much less generating the output wrench when the tool intrudes on the virtual cutting boundary. Wodicka fails to cure these shortcomings of Taylor and was not cited as doing so. Accordingly, it is submitted that claim 52 and claims 53-58 and 61-63 dependent therefrom distinguish patentably and unobviously over the references of record.

Claims 53-58 and 61-63 set forth additional details. The applicant reserves the right to further argue these additional details in further Office Actions or on an Appeal, as may be appropriate.

Claim 66 calls for an object of interest that includes a virtual haptic object that represents a virtual cutting boundary for the tool and is defined by a mapping between a pose of the tool and an output wrench of the haptic device. Claim 66 also calls for actuating at least one actuator of the haptic device to generate the output wrench based on the mapping and a determined scalar distance between the current position of the tool and the object of interest. Again, Taylor does not disclose or fairly suggest such a virtual haptic object. Accordingly, it is submitted that claim 66 and claims 67-72 dependent therefrom distinguish patentably over the references of record.

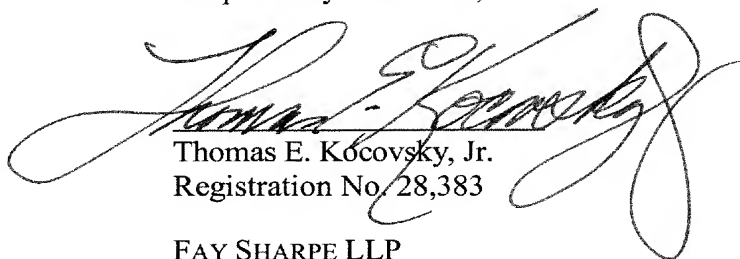
Dependent claims 67-72 set forth additional details. The applicant reserves the right to further argue these additional details in further Office Actions or on an Appeal, as may be appropriate.

### **CONCLUSION**

For the reasons set forth above, it is submitted that all claims distinguish patentably over the references of record and meet the other statutory requirements. An early allowance of all claims is requested.

In the event the Examiner considers personal contact advantageous to the disposition of this case, the Examiner is requested to telephone Thomas Kocovsky at 216.363.9000.

Respectfully submitted,

A large, stylized handwritten signature in black ink, which appears to read "Thomas E. Kocovsky, Jr.", is written over the printed name and registration number.

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